

## CLAIMS

What is claimed is:

1. A method for forming a patterned polymer layer on a transparent substrate, the method comprising the steps of:
  - (1) providing a removable mold having an intaglio surface with a patterned groove defined therein;
  - (2) attaching the removable mold to a transparent substrate, thereby the intaglio surface and the transparent substrate cooperatively forming a patterned channel;
  - (3) filling the patterned channel with a photopolymer solution;
  - (4) applying an ultraviolet light to the photopolymer solution through the transparent substrate so as to cure the photopolymer solution to the transparent substrate; and
  - (5) removing the removable mold with the patterned photopolymer layer formed on the transparent substrate.
2. The method as described in claim 1, wherein the photopolymer solution comprises colorants contained therein.
3. A method for making a color filter comprising the steps of:
  - (1) providing a removable mold having an intaglio surface with a plurality of groove units formed therein, the groove units being arranged in predetermined pattern ;
  - (2) attaching the removable mold to a transparent substrate, thereby the intaglio surface and the transparent substrate cooperatively forming a plurality of channel units;
  - (3) filling the channel units with a photopolymer solution containing colorants;
  - (4) applying an ultraviolet light to the photopolymer solution through the transparent substrate so as to cure the photopolymer to the transparent substrate; and

(5) removing the removable mold with the patterned photopolymer layer formed on the transparent substrate.

4. The method as described in claim 3, wherein prior to step (5), further comprising the steps of:

removing the remaining solution contained in the patterned channel;  
filling a photopolymer solution that does not contain colorants into the channels;  
applying an ultraviolet light to the photopolymer solution to cure the photopolymer into a leveling layer overlying the cured colored photopolymer.

5. The method as described in claim 3, wherein in step (2), the transparent substrate is first overlaid with a black matrix, the removable mold is then attached to a transparent substrate, with the patterned groove being superimposed with light-passing portions of the black matrix.

6. The method as described in claim 3, wherein in step (1), the groove units are separated by partition walls, and the groove units comprises three types of grooves in correspondence with red, green, and blue sub-pixels.

7. The method as described in claim 6, wherein in step (3), the three types of groove units are filled with corresponding red-colored, green-colored, and blue colored photopolymer solution, respectively.

8. The method as described in claim 7, wherein the neighboring groove units of a same type communicate with each other via through holes defined in the removable mold.

9. The method as described in claim 3, after step (5), further comprising the steps of:

thermal setting the colored photopolymer pattern on the transparent substrate;  
applying a black-colored photoresist layer on the transparent substrate and cover the colored photopolymer pattern;

exposing the black-colored photoresist from a back side of the transparent substrate; and

developing the black-colored photoresist to form a black matrix pattern.

10. The method as described in claim 9, wherein in step (1), a patterned reflective film is coated on the transparent substrate prior to attaching the removable mold to a transparent substrate, and said pattern comprises a light-passing black matrix pattern, a plurality of another light-passing openings, with edge-to-edge distance between each neighboring opening no bigger than the depth of the groove, within the areas of each sub-pixels; and the said ultra violet light is scattering in radiation path.

11. A color filter fabricated according to the method as described in claim 3.

12. An apparatus for making a color filter for use in a liquid crystal display, the apparatus comprising:

a main body, including an intaglio layer having a surface defining a plurality of groove units therein, wherein the groove units are arranged in a predetermined pattern, and the surface of the intaglio layer is adapted to be in contact with a transparent substrate, to thereby cooperatively form a plurality of cavities for receiving corresponding colored photopolymer solution therein; and at least one opening in communication with the groove units.

13. The apparatus as described in claim 12, wherein the groove units are separated by a plurality of partition walls.

14. The apparatus as described in claim 12, wherein at least one partition wall defines a through hole therein.

15. The apparatus as described in claim 12, wherein the main body further comprises a feeding layer with the at least one opening defined therein.

16. The apparatus as described in claim 15, wherein the feeding layer further

comprises at least one inlet hole in communication with the at least one opening.

17. The apparatus as described in claim 15, wherein the main body further comprises a shunt layer interposed between the intaglio layer and the feeding layer, the shunt layer comprises at least one channel in communication with the at least one inlet hole.

18. The apparatus as described in claim 17, wherein the main body further comprises an intermediate layer interposed between the intaglio layer and the shunt layer, the intermediate layer comprises at least one through hole in communication with the at least one channel of the shunt layer and the groove units of the intaglio layer.

19. The apparatus as described in claim 12, wherein the mold is formed of sheetlike metallic materials.

20. The apparatus as described in claim 12, wherein the mold is formed of sheetlike polymer materials.

21. The apparatus as described in claim 12, wherein the mold is formed of composite layers of sheetlike metallic materials and polymer materials.

22. The apparatus as described in claim 12, wherein the main body is attached to a flat base substrate in the side opposite to the intaglio surface.

23. The apparatus as described in claim 19, wherein a protection layer is coated on the exposed metallic surfaces in contact with said solution in the removable mold.

24. The apparatus as described in claim 13, wherein the partition walls are formed of polymer materials.

25. The apparatus as described in claim 23, wherein the polymer materials contain UV absorbing materials.